

XIII.—On the species of Stickleback (*Gasterosteus*, Linn.) found in Ireland. By WM. THOMPSON, Vice-Pres. Nat. Hist. Society of Belfast.

IN the 'Histoire des Poissons' of Cuvier and Valenciennes, the *Gasterosteus aculeatus* of Linnæus is divided into several species. The views there adopted are followed in Great Britain* by Mr. Yarrell and Dr. Parnell in their respective works; but in Mr. Jenyns's 'Manual,' four of these species—all that have been recognised as British—are, after a close comparison of examples from the same pond, and of these again with others from different waters, reduced to one species †. Having myself compared specimens of the fish in question from still more numerous localities than the last-named author, I arrive at the same conclusion in so far as it extends; but go still further, and venture to consider six or seven of the species of the 'Hist. des Poiss.' as in reality but one, assuming so many different appearances. To allude to the extreme accuracy of description characteristic of that truly great work—the 'Hist. des Poiss.'—would be most superfluous. On another point altogether the different view adopted in the present paper turns; namely, on the *permanency of characters* there attributed to the 3-spined *Gasterosteus*.

In this genus, Ireland possesses all the forms which are included in the British catalogue. An additional one—*G. semiloricatus*, Cuv. and Val.—will be particularly treated of, and come first under notice, as one of the two varieties which are protected with scaly plates throughout the sides.

G. trachurus, Cuv. and Val., t. iv. p. 481.

G. semiloricatus, Cuv. and Val., t. iv. p. 494.

March 20, 1835.—On examination of a number of 3-spined Sticklebacks from the island of Rathlin, (sent by Mrs. Gage

* Nilsson, in his 'Prodomus Ichthyologiæ Scandinavica,' published in 1832, thus describes varieties of *Gast. aculeatus*, Linn.:—

“*α.*) Capite, a latere inspecto, magis acuto; spinis dorsalibus longioribus, media longitudinem capitis dimidiam æquante et dimidiam corporis altitudinem superante.

“*β.*) Capite, a latere inspecto, magis obtuso; spinis dorsalibus brevioribus; media multo brevior quam $\frac{1}{2}$ capitis et dimid. corpor. altit.”—p. 86.

This author makes *G. trachurus* synonymous with *G. aculeatus*, Linn.—he does not offer any opinion on the species of *Gasterosteus* in the 'Hist. des Poiss.'

† In a note to p. 350, Mr. Jenyns observes with reference to *G. brachycentrus*, that “it is more than probable that some of the other foreign *Gasterosteis* described by Cuvier are mere varieties of this species”—*G. aculeatus*, Linn.

to Dr. J. D. Marshall, who submitted them to my inspection,) I find that in some the lateral plates extend throughout the entire sides, as in *G. trachurus*; in others, so far only as in *G. semiarmatus*; and in some again no further than in *G. lieurus*. No other difference can be perceived in these specimens, which are all of a small size, from an inch to an inch and a half in length. From between tide-marks in Larne Lough (Mrs. Patterson); from oozy and rocky pools over which the tide regularly flows, situated near the edge of Belfast Bay (Richard Langtry, Esq.—W. T.); also from a deep pool in the middle of it (Mr. James Nichol)—and from the harbour of Donaghadee (Capt. Fayrer, R.N.), I possess examples of the full-armed Stickleback of various sizes up to 3 inches.

In addition to these Irish examples of the full-armed Stickleback, some 2 inches in length from the Thames, communicated in 1834 by Mr. Yarrell, are before me for comparison, and several from $1\frac{1}{4}$ to $1\frac{3}{4}$ inch, which I obtained in a marine rock-pool at Ballantrae, Ayrshire, in August 1839.

In June 1836, Lieut. Davis, R.N., sent to the Belfast Museum, from the neighbourhood of Donaghadee, some gigantic specimens, two of which are $3\frac{1}{2}$ inches in length and 10 lines in depth; a third is 3 inches 4 lines long and 9 lines deep; the number of fin-rays is the same in all, viz.

D. III + 12; A. I + 9; P. 10; V. I + 1; C. 12.

These three individuals have each 23 plates on the side of the body to the origin of the caudal keel, and thus agree with the *G. semiloricatus*. Colour as usual in female specimens, no red appearing anywhere. With the above were two others of ordinary size; one of which was red on the lower portion of the body. Lieut. Davis stated in a note respecting them, that they "were found in a pool of brackish water accessible to the sea, at the Foreland rocks near Donaghadee." The example, $2\frac{1}{2}$ inches in length, from deep water in Belfast Bay, differs very much from the large individuals just noticed, in the free margins of the lateral plates; these, in the latter are finely, regularly, and very minutely serrated, while in the former they are distinctly toothed, the denticles becoming larger on the plates as these latter approach the tail. The number of these plates to the origin of the caudal keel is about 23, as in the large examples—this number likewise appears in the Thames specimen of *G. trachurus*. With the exception of a ray less in the anal fin, the number of fin-rays is the same in that under consideration as in the large fish. The example, 2 inches in length, from Donaghadee harbour, has likewise about 23

plates on the side to the origin of the caudal keel: the serration on the free margin of these plates is intermediate between that exhibited in the specimens from the Foreland Point and the one just noticed from Belfast Bay.

In the full-armed Sticklebacks from the localities generally, which have been enumerated, great differences are observable, as—considering for the present adult fish only—in the comparative length of the dorsal and ventral spines, and in the lateral plates. In some individuals these do not occupy more than the central portion of the sides, in others the whole sides, and again are intermediate.

In the absence either of a specimen for comparison, or a figure to refer to, it may perhaps be considered that certainty cannot be arrived at respecting *G. semiloricatus*. This fish is stated to differ from *G. trachurus* in having only 22 or 23 plates on each side to the origin of the caudal keel instead of its 25 or 26, and in the shoulder-plate (plaque de l'épaule) being larger. It has been seen that some of my specimens, and of these, some of the largest size, possess only the number of lateral plates attributed to *G. semiloricatus*. In examples of equal length, and from the same as well as from different localities, I find the size of the shoulder-plate to vary like other characters. Hence I am disposed to regard some of the examples under consideration as this fish.

In the 'Hist. des Poiss.' it is remarked of *G. semiloricatus*, "Nous n'avons pu trouver aux environs de Paris que des épinoches à queue nue; il nous en est venu de pareilles des départemens de la Somme et de l'Oise, de la Rochelle et de quelques autres lieux: nous avons observé celle à queue cuirassée dans les ruisseaux des côtes de Normandie, et encore récemment M. Deslongchamps nous l'a envoyée de Caen, et M. Baillon en a pris dans le Hable-d'Ault, lac saumâtre de l'embouchure de la Somme, près du Tréport. C'est la seule qui se trouve dans les étangs des environs de Berlin, et elle y est en quantité innombrable. Peut-être est-ce l'espèce qui habite plus fréquemment près des bords de la mer, et qui peut entrer dans l'eau salée. Des observations ultérieures nous apprendront sans doute bientôt ce qui en est."—*t. iv. p. 494.*

This accords generally with my own observation, as in seven out of the nine localities whence my specimens mailed throughout the sides were derived—whether they be called *G. trachurus* or *G. semiloricatus*—they were taken either in the sea or estuary. The exceptions are the largest specimens, which were procured in a "pool of brackish water accessible to the sea;" and those from Rathlin, obtained in

fresh water. From the passage just quoted, we learn that the *G. semiloricatus* inhabits the pools about Berlin. It has always seemed to me not improbable, that in the sea, where the enemies of this diminutive fish are more numerous than in the fresh water, the protecting hand of Nature had as a defence armed its body with these lateral plates. That some fishes have the power of accommodating their colour to that of the ground or bottom of the water they frequent, and are thus rendered comparatively inconspicuous to their enemies, is well established.

A third species of 3-spined Stickleback, armed throughout the sides like those here treated of, is the *G. Noveboracensis*, which, as its name denotes, is found at New York. Judging from the description and figure of this fish in the 'Hist. des Poiss.,' I should not consider it distinct from *G. trachurus* or *G. semiloricatus*. The specimens which have come under my examination differ much in the few characters which are said to distinguish this fish from *G. trachurus*. The high position of the lateral line is the chief character of *G. Noveboracensis*—in some specimens before me this line is so near the back, that three-fourths of the body of the fish are below it. Our *G. Pungitius* is admitted as an American species by Dr. Storer in his interesting work on the 'Fishes, &c. of Massachusetts' (p. 32), and for a copy of which I am indebted to his kindness.

The descriptions and figures of the *G. obolarius*, Cuv. and Val.—a 3-spined Stickleback armed throughout the sides, and found in the North Pacific Ocean and the Gulf of Kamtschatka,—are said in the 'Hist. des Poiss.' to be insufficient to mark it with certainty as a species distinct from the full-armed *Gasterosteus* of Europe or America (p. 500).

Dr. Parnell, in his 'Fishes of the Frith of Forth' (p. 34), after stating that he agrees with Cuvier and Yarrell in considering the *G. trachurus* as "a constant and well-marked species," observes that the "square tail" does not exist in the other Sticklebacks. According to my observation, it is certainly less developed in them, and generally (but not invariably) corresponds with the protecting side-plates, presenting a greater or less development accordingly as the armature of the body is of a heavier or lighter cast. Dr. Parnell further remarks, as corroborative of *G. trachurus* being a distinct species, that he has "examined carefully several hundred from half an inch to two inches and a half in length, and in all the specimens the lateral plates were constant." In particular localities I have met with the same result on ex-

aming specimens of all sizes of *G. trachurus* and of the other varieties also*, but in some places again the different varieties are found together and of every size †. Mr. Yarrell has so noticed three of them in the Thames at Woolwich; and in Rathlin, as before mentioned, they occur together—in the former locality in brackish, in the latter, in fresh water.

G. semiarmatus, Cuv. and Val., t. iv. p. 493, appears to be the rarest of the 3-spined Sticklebacks in Ireland. I possess specimens from the island of Rathlin, as before mentioned, and from Wolfhill, in the neighbourhood of Belfast. One example only occurred in the latter locality, where it was taken in 1832 with a number of *G. brachycentrus*, the Stickleback of that district—it is indeed this variety in every respect, except in having the lateral plates extending along the sides so far as in *G. semiarmatus*; the other characters assigned to this supposed species in the 'Hist. des Poiss.' are very variable. From the half-armed species I turn to the

G. lieurus, Cuv. and Val., t. iv. p. 487, in which the lateral plates do not extend beyond the pectoral region. In every respect but this, it is considered in the 'Hist. des Poiss.' so similar to *G. trachurus*, that the one description is given as equally applicable to both. The *G. lieurus* would seem to be the most common *freshwater* Stickleback in Ireland ‡.

The localities whence specimens of this fish are now before me, are—the island of Rathlin;—the neighbourhood of Belfast (W. T.);—river Bann at Toome (W. T.);—Portaferry and Newcastle, county Down (W. T.);—Lough Melvin, county Fermanagh (W. T.);—neighbourhood of Dublin (Mr. R. Ball);—Glendalough, county Wicklow (Mr. G. C. Hyndman);—Portarlinton, Queen's-county (Rev. B. J. Clarke);—some of the examples from this locality are very handsomely marked, being along the back of a rich brown colour, which

* The partial exception to this is in *G. brachycentrus*, in which the dorsal spines are comparatively longer in young than in adult individuals, and hence the young in this respect accord with *G. lieurus*. I here speak of localities in which all the full-grown fish are *G. brachycentrus*.

† From the many small examples of all the varieties about nine lines in length that have come under my observation, I should think the number of lateral plates they are to possess through life is then as decided as the number of fin-rays; *i. e.* provided they would have remained in the locality whence they were taken. Whether such a change of habitation, as from fresh water to the sea, would cause the smooth-sided at any age to put on the lateral armour, may remain a question.

‡ From drains which are occasionally replenished by the tide I have also taken it.

is continued down the sides in the form of regular transverse bands upon a yellow ground;—river Shannon, at Killaloe (Rev. C. Mayne);—Youghal, county Cork (Mr. R. Ball).

From Scotland I have specimens obtained in the neighbourhood of Portpatrick by Capt. Fayer, R.N. Examples from the Thames have been favoured me by Mr. Yarrell; and in the river Leam, at Leamington, Warwickshire, the *G. lieurus* has occurred to myself. Next to this variety naturally comes the

G. brachycentrus, Cuv. and Val., t. iv. p. 499, which like it, is smooth along the sides from the pectoral region, but differs in the shortness of the dorsal and ventral spines. From the comparative length of these spines alone do I distinguish the two varieties, the other characters attributed to *G. brachycentrus* being ever varying. The Irish localities whence I have this fish, are the neighbourhood of Belfast, and pools along the margin of Lough Neagh (W. T.), Dublin, Youghal, and Portarlington—supplied from these three localities by the friends before mentioned.

The largest example which has come under my observation was one taken by myself in England, at Stow Pool, Lichfield, in July 1836, and which was noticed in the 'Proceedings of the Zoological Society' for the next year. This is the only allusion I have seen to the *G. brachycentrus* in Great Britain.

This variety, which from the shortness of its spines is the most defenceless of the 3-spined Sticklebacks, we should, *à priori*,—i. e. if the suggestion respecting the full-armed variety be correct—expect to find where it has fewest enemies, and such, according to my very limited observation, is the case. This would seem to be the variety more peculiar to still water, in which it often attains a very large size. The only continental notice of this fish known to me is that in the 'Hist. des Poiss.,' where it is stated to have been obtained by M. Savigny in the brooks of Tuscany.

The following comparison between *G. brachycentrus* from the neighbourhood of Belfast, and specimens of *G. lieurus*, &c. from the Thames, favoured me by Mr. Yarrell, was drawn up early in 1834:—

In form of outline the Irish fish generally differs much from the *G. lieurus*, the latter being from the centre of the back alike gracefully sloped on either side to the head and tail, giving that part a handsome and finely-arched appearance; the under side of the body also exhibits more of this form than that of its congener. The back of the Irish species, instead of thus sloping gradually to the centre,

is at that part rather flat, and is at least as high where the dorsal fin originates as elsewhere. The Irish fish is in proportion to its depth longer than the *G. lieurus*, as specimens of the latter under $2\frac{1}{2}$ inches in length, when compared with Irish specimens 3 inches long, proved of equal dimensions (8 lines) at the deepest part. The difference is also strongly marked in the relative breadth of the two species, the Irish maintaining considerable breadth throughout, even to the origin of the caudal fin. The *teeth* in the lower jaw of the Irish species consist in the centre of about four rows irregularly disposed, but become gradually less numerous towards the back of the mouth, where they terminate in a single line: the upper jaw contains three rows in front, the outer and inner being regular in distribution. In number, the *G. lieurus* which I examined does not possess so many teeth as that species, but in their arrangement there is little difference. On reckoning the *vertebræ* in a specimen of the *G. lieurus* and in one of the Irish Sticklebacks of similar length, I find that the number in the latter exceeds that in the former species, and that they are throughout more regularly equidistant than in the *G. lieurus*.

In the three English Sticklebacks, *G. trachurus*, *G. semiarmatus* and *G. lieurus*, the bony plate covering the head is much stronger than in the Irish fish—the outline of the lower jaw more angular—the lips smaller and less fleshy—the number of rays in the fins different, consisting generally, in the Irish specimens, of twelve in the dorsal, ten in the pectoral, eight in the anal, and twelve in the caudal. In the three English *Gasterosteii*, also, the ventral spine is longer, but not so broad as in the Irish fish—the dorsal spines considerably longer, and the plates whence they spring proportionately larger. The following is the measurement of the spines in the four species:

	Total length of fish.	First dorsal spine.	Second.	Ventral.
<i>G. trachurus</i>	2 in. $1\frac{1}{2}$ lin.	$2\frac{1}{4}$ lin.	$2\frac{3}{4}$ lin.	4 lin.
<i>G. semiarmatus</i> ..	2 6	$2\frac{1}{2}$	3	$4\frac{1}{2}$
<i>G. lieurus</i>	2 6	$2\frac{1}{2}$	3	$4\frac{1}{2}$
Irish species, }	3 0	$1\frac{1}{2}$	$1\frac{3}{4}$	$3\frac{1}{4}$
<i>G. brachycentrus</i> }				

In the last species* the membrane extends to the extremities of all the spines.

About Belfast I have taken the smooth-sided Sticklebacks—*G. lieurus* and *G. brachycentrus*—from ditches in the low grounds, from clear mountain-streams at an elevation of 600 feet above the level of the sea, from the muddy rivers Blackwater and Lagan, and from water which was partially salt (here *G. lieurus* only), when, contrary to what might be ex-

* Agreeably to the view taken in the 'Hist. des Poiss.,' the term "species" was here applied to *G. brachycentrus*. I was disposed at the time (1834) to regard it as a local variety, but had not the means, which have since been afforded by a comparison of specimens from numerous localities, to arrive at a certain conclusion on the subject.

pected, the largest were invariably found where the temperature was lowest, specimens there (*G. brachycentrus*) not uncommonly attaining the length of three inches, and perfectly free from the pearl-like tumours, which, adhering to the body, infest those inhabiting the comparatively warm waters of the lower grounds. This short-spined Stickleback here exhibits, in all respects, the same colours as the most common of the English varieties; of many of the larger individuals captured in the month of September, about the one-half were red on the under parts. In large shoals too I have remarked fully this proportion to have assumed the scarlet, and in the early summer months have observed that full-grown fishes, in which the most intense shade of this colour prevailed, never appeared to be with spawn*, very few in that state being so much as faintly tinged with it. This *Gasterosteus* and the Trout (*Salmo Fario*) seem not to co-exist in some of our smaller rivers, or do so very partially. In the stream whence the largest of these were taken, trout (*Salmo Fario*) were a dozen years ago very common, and the Stickleback unknown, and it is only since the almost total disappearance of the Trout that this fish has been established in its waters. In a similar stream issuing from the same mountain-range at about four miles distance, the Trout yet maintains its place, and in the parts of the river frequented by it I have in vain looked for the Stickleback.

The figure of *G. brachycentrus* in the 'Hist. des Poiss.' resembles the Irish fish when in spawn, and not its usual appearance.

In addition to that fish, there is another 3-spined Stickleback, brought by M. Savigny from the brooks of Tuscany, described as new in the 'Hist. des Poiss.'—from its brilliant operculum, it is named *G. argyropomus*. In this and the other characters assigned to it, Irish specimens in my possession fully accord. It is suggested, indeed, with reference to the characters attributed to this and the two other *Gasterostei*—*G. brachycentrus* and *G. tetracanthus*—brought by M. Savigny from Tuscany—"Nous allons les indiquer, pour engager les observateurs à s'assurer de leur constance," p. 498. In the next page it is however remarked of *G. brachycentrus*, that there is no doubt of its being a true species †.

Four-spined Stickleback, *G. spinulosus*, Yarr. and Jenyns.

Among specimens of *Gasterostei* kindly procured for me at

* So late as the 19th Sept. 1832, I remarked one large with spawn.

† The different varieties of the 3-spined Stickleback are commonly known in the North of Ireland by the name of Spricklebag—evidently a corruption of the proper term—Pinkeen is applied to them in the South; and from the Shannon they have been sent me under the name of Thornback.

La Bergerie, near Portarlington, Queen's-county, by the Rev. B. J. Clarke, is an individual with four spines. It is $1\frac{1}{4}$ inch long; the first and second spines are of ordinary length; the third spine is short, but exceeding the fourth. In no other character than that of having four spines, does this fish differ from the 3-spined examples taken with it, and consequently I cannot look upon it otherwise than merely an accidental variety of *G. aculeatus*, Linn. It was among a parcel, consisting of *G. lieurus*, *G. brachycentrus* and *G. Pungitius*, taken in a pond and in some neighbouring drains. The "ascending plate from the base of the ventrals" (see Jenyns's Manual, p. 350), I find subject to variety of form like other parts.

That the fish under consideration is the *G. spinulosus*, seems to me not to admit of doubt*.

Ten-spined Stickleback, *G. Pungitius*, Linn.

This diminutive fish is "rare"—as has already been noticed by Templeton †—in Ireland, comparatively with the 3-spined species. The localities whence I possess it are very few in number, viz.—pits excavated in brick-making on the banks of the Blackstaff river, near Belfast; a marsh in the neighbourhood of Portaferry, county Down (W. T.); and La Bergerie, Queen's-county (Rev. B. J. Clarke)—from this locality a considerable number were sent, and among them the largest native specimens I have seen, a few being $1\frac{3}{4}$ inch in length, and one having attained to $2\frac{1}{4}$ inches.

From the neighbourhood of Portpatrick, Scotland, this species has been sent me by Capt. Fayrer, R.N. For examples from the Thames I am indebted to Mr. Yarrell; and in the river Leam, near Leamington, Warwickshire, it has occurred to myself.

In most of the above localities the 3-spined species was taken with the *G. Pungitius*. All of the latter, whether from brackish or fresh water, are smooth throughout the sides (*G. lævis*, Cuv. 'Règne Animal,' 2nd ed. ‡), and but a very few individuals present any appearance of a keel on the sides of the tail. The dorsal spines vary from nine to eleven in number, and do so in examples of equal size from the same place.

* Since the above was written, I have been gratified to find that my friend Dr. Johnston, in a 'List of the Fishes of Berwickshire, exclusive of the Salmones,' considers the *G. spinulosus* a variety only of the 3-spined species—of these he notices the "Rough-tailed, Half-armed, and Smooth-tailed Sticklebacks" of Yarrell, as varieties only of one species. (See Report of the Berwickshire Naturalists' Club for 1838, p. 171.)

† Mag. Nat. Hist. vol. i. New Series.

‡ See also Hist. des Poiss. t. iv. p. 507.

Fifteen-spined Stickleback*, *G. Spinachia*, Linn.

This species, differing from *G. aculeatus* and *G. Pungitius* in being strictly a marine fish, is found around the coast of Ireland. I possess examples obtained at Rathlin, in the north (by Dr. J. D. Marshall); Bundoran, in the west (W. T.); Youghal, in the south (by Mr. R. Ball), and on the coasts of Down (W. T.); and Antrim (by Mrs. Patterson), in the north-east.

On the southern coast, where sprat-fishing is regularly practised, the *G. Spinachia* is taken in greater quantity than in the north. Mr. R. Ball on one occasion knew as many to be captured with the Sprat (*Clupea Sprattus*), at Youghal, as would "fill a bushel," and at Glendore and the south-west coast of Cork generally, Mr. G. J. Allman informs me that it is often taken at the same time with this fish. On the coast of Down full-grown specimens have occasionally occurred to me when dredging, and likewise under stones between tide-marks, and one or two individuals may sometimes be seen in the fish-market at Belfast, whither they are brought with quantities of the Atherine (*Atherina Presbyter*) from Portaferry, in the winter and early spring. In the rock-pools, on different parts of the coast, the fry of *G. Spinachia* may be observed in the month of June about three-quarters of an inch in length; and in such places I have at Bangor (county Down), in the middle of September, captured them of twice that size, where in winter neither young nor adult examples ever occurred to me.

Both the *G. aculeatus* and *G. Pungitius* were included in Dr. Patrick Brown's 'Catalogue of the Fishes of Ireland,' published in Exshaw's Magazine for 1774—the former species was noticed two years before in Rutt's 'Natural History of the County of Dublin.' In M'Skimmin's 'History of Carrickfergus,' and in Mr. Templeton's 'Catalogue,' the *G. Spinachia* has a place.

In one respect the foregoing pages may be considered rather as exhibiting a retrogression than an advancement of the subject, as in them an attempt is made to restore what have latterly been considered as several species simply into the three described by Linnæus as *Gast. aculeatus*, *G. Pungitius* and *G. Spinachia*.

* Horn-eel is a common name for this species in the North.